Climate Change in the Crown of the Continent

Climate change is one of the most pressing issues of our time. The impacts of a rapidly warming world may affect every aspect of life on earth. As the earth's temperature continues to rise, many plant and animal species increasingly face rapid adaptation, migration, or even extinction. Our national parks demonstrate how warming temperatures are changing the environment and may provide a refuge for plant and animal species. They help us to understand the extent of climate change, how to mitigate its effects, and how to protect our natural and cultural treasures for the enjoyment of our children and grandchildren.

In Glacier National Park, the impacts of climate change are becoming increasingly evident. The park's changing environment provides a powerful example of what could be lost without global action to reduce greenhouse gas emissions. Glacier's diverse landscape is the ideal outdoor laboratory, helping scientists show how climate change affects an intact ecosystem. Glacier National Park strives to be a leader in educating park visitors about climate change and has developed in-park solutions to reduce energy consumption in park operations. Some of the park's conservation efforts are solutions visitors can apply to their own communities and everyday lives.

CLIMATE*Friendly* PARKS

The Climate Friendly Parks Program, a collaboration of the National Park Service and the U.S. Environmental Protection Agency, provides national parks with the tools and resources to address climate change. The program aims to provide national parks with support to address climate change both within park boundaries and in surrounding communities.

As a Climate Friendly Park, Glacier National Park is confronting climate change head on. The park is working to increase in-park energy efficiency and alternative energy use, as well as educate visitors through interpretive programs and displays. Other park initiatives include:

- Since inception, Glacier's public shuttle system has transported over 350,000 visitors through the park, decreasing the park's carbon footprint and reducing visitor traffic.
- The Transit Center in West Glacier is a LEED certified building.
- The "Red Bicycle" program offers employees transportation alternatives for traveling around the park.
- Recycling opportunities for visitors and staff are available throughout the park
- Red "jammer" buses have been refurbished to use cleaner-burning propane.
- The park is monitoring energy use in buildings to maximize efficiency.

For more information about the Climate Friendly Parks program visit: www.nps.gov/climatefriendlyparks

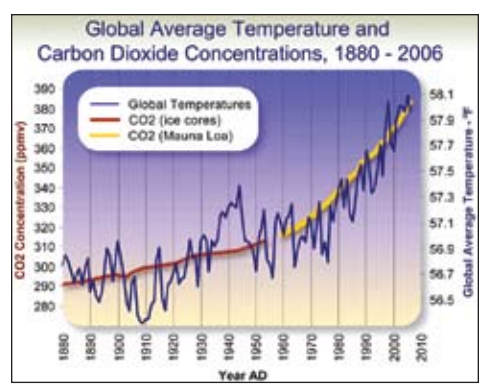
Our Changing Climate

While the Earth's climate changes naturally, the rate of warming experienced over the last century is unprecedented. The global consensus is that a significant part of this warming is due to human activities. As a result, climate change is threatening our greatest natural and cultural resources.

Scientists link the rise in Earth's surface temperature to the accumulation of certain gases in the atmosphere, such as carbon dioxide, methane, and nitrogen oxides. These are commonly known as greenhouse gases (GHGs) because they trap heat within our atmosphere. Without GHGs, life on earth would not be possible.

Increasing amounts of GHGs in the atmosphere are resulting in the unprecedented warming we are experiencing today. Many human activities, especially those related to the consumption of fossil fuels, result in the emission of GHGs into the atmosphere. These emissions stay in the atmosphere for several decades, making immediate GHG reduction critical to mitigating the impacts of climate change.

Without a dramatic reduction of greenhouse gases, scientists project that by the end of this century the Earth's surface could warm an additional 5–10 degrees Fahrenheit.



Graph courtesy Woods Hole Research Center

Ecosystem Solutions

While some impacts of climate change are inevitable, park managers work with neighboring communities and agencies to give fish and wildlife a better chance to adapt. Fortunately, Waterton-Glacier International Peace Park lies at the core of the greater Crown of the Continent ecosystem in Alberta, British Columbia and Montana, a place where animals can still move freely across borders.

The region's natural diversity of species and habitats helps buffer the impacts of rapid change. Scientists have developed guiding principles to promote resiliency to warming climate.

- **Freedom to Roam:** Plant communities and wildlife habitats can shift with warmer climates, and animal species are better able to survive if they can move, too. Some may need to expand their range, climb in elevation, or move northward. Conservationists seek to protect connectivity corridors by maintaining open lands between key habitats and even construct road crossings for wildlife.
- **Protect the headwaters:** Three major rivers of North America originate here, flowing to the Atlantic and Pacific Oceans, and north to Hudson's Bay. By minimizing development and protecting shaded streamside zones, community groups and land managers are keeping these waters clean, cold and free-flowing for native trout and downstream uses.
- **Collaborate, renew and restore:** Rapid change favors plant and animal species that quickly colonize an area disturbed by logging, wildfire or construction. Land managers collaborate to control the spread of exotic weeds, revegetate lands with native species, and reduce pollution to streams. Through cooperative stewardship, private land owners and public agencies can reduce the negative impacts of wildfires, floods and drought.

Impacts to Glacier National Park

Glaciers are responsible for the sculpted peaks, hanging valleys, and azure lakes that inspire park visitors. However, glaciers provide much more than scenery. They are an integral part of the ecosystem, especially during dry periods and pouring cold water into thirsty streams during the hottest days.

In 1850, there were an estimated 150 glaciers in the park. Today there are 25. Scientists predict (at current rates of warming) the glaciers in Glacier National Park will disappear by 2020.

Mountain snowpack has also declined as a result of warming temperatures. Due to changing precipitation and seasonal patterns, snow is often replaced with rain resulting in earlier spring runoff and a decrease in water availability in dry months. This will mean a greater flood potential, and an increase in water temperature in aquatic ecosystems. This trend is expected to have major consequences for aquatic species such as bull trout, harlequin ducks, and tailed frogs.

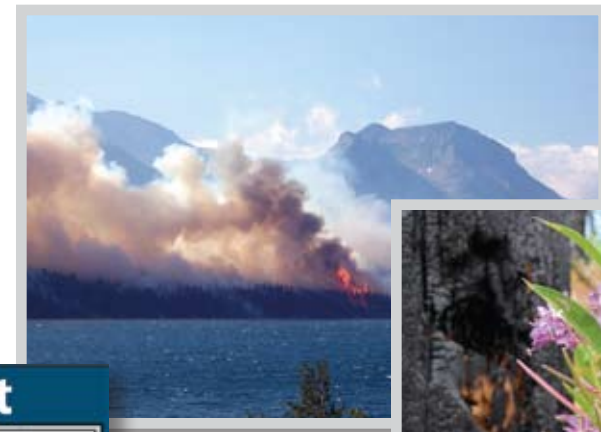
Alpine meadows are expected to change rapidly over the next several decades. These high altitude meadows provide habitat for an incredible array of rare species such as pika, mountain goats, and grizzly bears. In addition to less water availability in alpine meadows, the longer growing season is allowing treeline to climb in elevation, decreasing the alpine habitat these species depend on.

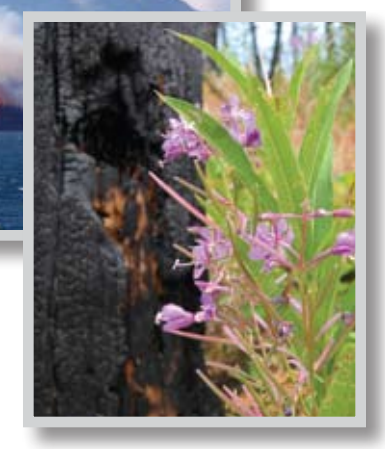
Hotter, drier summer seasons are resulting in bigger fires, hotter fires, more stand replacing fires, and fires at higher elevations than previously recorded. While fire has helped shape Glacier's landscape, fires that are too intense may make it difficult for native species to return and allow destructive nonnative species to thrive.

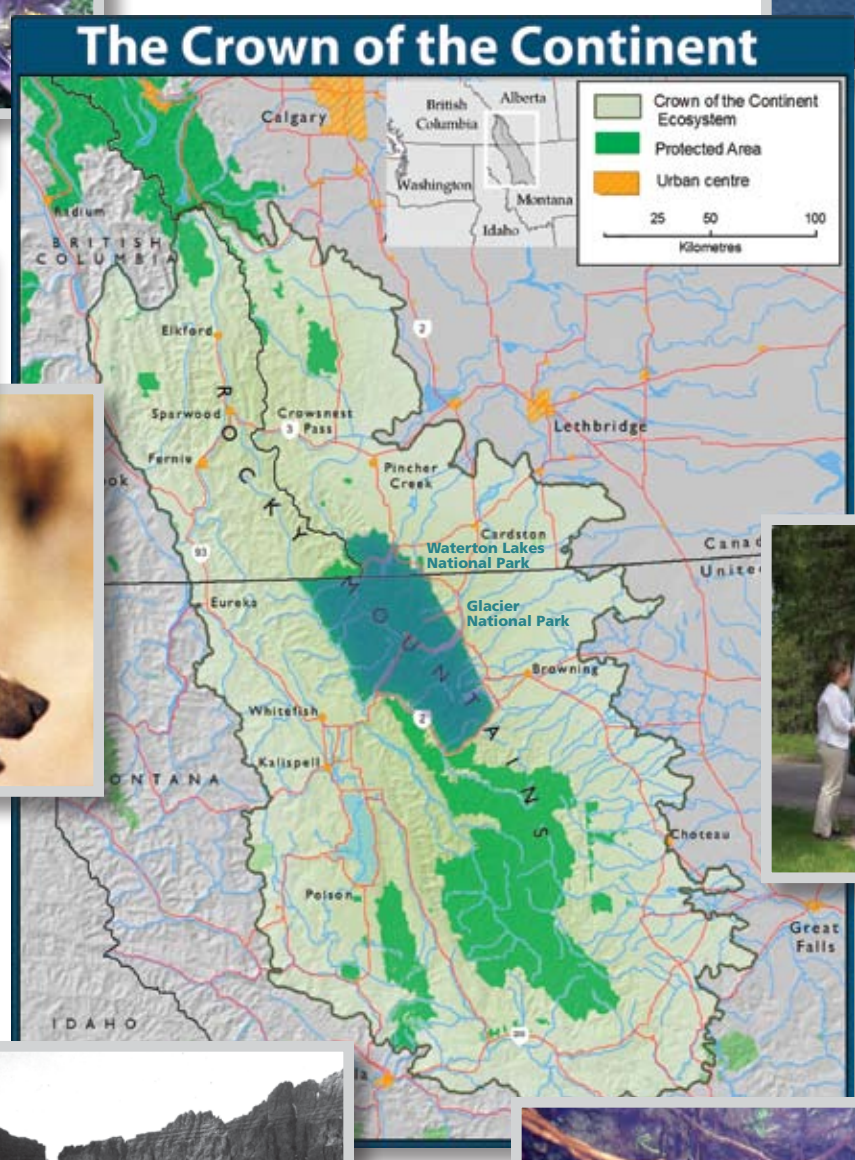
The Changing Landscape

Plant Communities

Plant communities from the moist Pacific Northwest converge with species from the prairie and northern forests, creating a complex ecological brew. For example, with more than 1,000 vascular plant species, Waterton and the adjoining Castle River Valley are home to the richest diversity of plants in Alberta. Warming temperatures threaten some native plants, such as Jones' columbine, while exotic weeds are poised to invade.





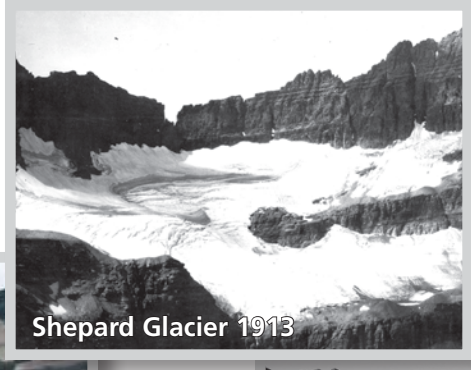


Fire in the Crown of the Continent

An increase in hot summer days (90°F and greater) and a decrease in the number of days of frost have resulted in larger and more severe wildfires. Although fire is natural part of Waterton-Glacier's ecosystem, increasing fire size and intensity is resulting in unprecedented changes throughout the region's wild forests.

Wildlife Beyond Borders

Grizzly bears and other wildlife freely traverse multiple ownerships and the international border. The transboundary North Fork Flathead Valley is a critical wildlife corridor. British Columbia and Montana have taken the initial steps to ban mining and gas drilling, in an attempt to preserve vital ancient wildlife pathways. As the climate warms and plant communities change, animals need the freedom to roam in search of suitable habitat.



Vanishing Glaciers

In 1850, there were an estimated 150 glaciers in the Glacier. By 1968, the number was reduced to around 50. Today, only 25 glaciers remain in the park, many of which are mere remnants of what they once were. Scientists predict all glaciers in Glacier National Park will be gone before 2030.

Reducing Our Carbon Footprint

As a Climate Friendly Park, Glacier is committed to increasing energy efficiency in park operations. The park will continue to educate park visitors through interpretive programs, displays, and leading by example. Glacier's popular tours and new shuttle system provide visitors the opportunity to enjoy the park's scenery in a more environmentally friendly way.

Native Trout

One population of bull trout migrates more than 100 miles from Flathead Lake to spawning streams in Canada. All bull trout require clear, cold water and clean gravel-bottom streams to reproduce and survive, The Crown of the Continent is one of bull trout's last strongholds, especially in Glacier, Montana's Swan Valley, and the transboundary Wigwam and Flathead rivers. Scientists are concerned about the ability of bull trout to survive the long-term impacts of climate change.

Glacier National Park Fund is *Glacier's official fundraising partner*

"The Citizen Science Program offers dual benefits of providing valuable climate change data at a fraction of formal study costs and it creates volunteer stewards that help us safeguard Glacier's animals and plants for future generations to enjoy."

Jane Ratzlaff, Executive Director

Support the Citizen Scientist Program! Current studies include loons, mountain goats, pikas, Clark's Nutcrackers and five invasive plant species.

- 180 citizen scientists in 2010 with a total of 5,100 hours served
- Valuable data contributes to scientific based management decisions
- Join us as a volunteer or donate to this program today!

Glacier National Park Fund (GNPF)

- Created in 1999 to support trails, historic preservation, education and research projects in Glacier
- $3 million in grants to the park since our inception
- To learn more or to make a gift today, please visit www.glacierfund.org

National Parks Conservation Association®

Protecting Our National Parks for Future Generations®

America's national parks protect our nation's most important natural and cultural treasures, and inspire nearly 300 million visitors each year. Yet within the parks, we can already see signs of damage from global warming. With the "Do Your Part!" program, parks such as Glacier are offering a unique opportunity for visitors to help take care of our national parks, and inspire their families, friends, and communities to be better stewards of these special places.

Tom Kiernan, NPCA President

Founded in 1919, the National Parks Conservation Association (NPCA) and its 340,000 members are committed to protecting and enhancing our national parks for existing and future generations.

NPCA is committed to restoring healthy air, thriving ecosystems, and scenic values to our national parks. NPCA supports decisive action at the local, state, and national levels that protect the integrity of our national parks by reducing greenhouse gas emissions and climate change impacts.

To learn more or join NPCA go to: www.npca.org.

NPCA would like to thank the Hon. Laurence William "Bill" Lane, Jr. for his commitment to environmental stewardship and support in making this section of the Glacier Guide possible.

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